ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 02 | February - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

COMPARISION OF CORD BLOOD LIPID PROFILES BETWEEN IDM AND NON IDM NEONATES

Paediatrics

Dr Paneendra Reddy B S — Junior Resident, Department of Paediatrics, Rajarajeswari Medical College and Hospital, Bangalore

Dr Kartik R — Professor and Unit head, Department of Paediatrics, Rajarajeswari Medical College and Hospital, Bangalore

Dr Adarsh E — Head of the Department, Department of Paediatrics, Rajarajeswari Medical College and Hospital, Bangalore

ABSTRACT

Background: Gestational diabetes mellitus (GDM) is one of the serious causes for feto maternal morbidity and long term complications in both mother and child. Due to better screening modalities, early detection and better treatment option like insulin have helped to lower the complications in Infants born to diabetic mothers (IDM). As atherosclerotic diseases in adulthood have become rampant, early detection of high risk groups is necessary. Based on Barker's hypothesis, atherosclerosis in adulthood have predisposing factors starting from in-utero. So this study was taken up to compare the cord blood lipid profile levels in IDM babies and infants born to normal mothers. **Methods:** This prospective (case-control) study was carried out on 60 infants born in Rajarajeswari Medical College and Hospital, from July 2022 to December 2022. The study group consisted of 30 IDM babies, and the control group of 30 infants who were born to healthy mothers. **Results:** The results of this study demonstrated that there are significant differences between IDM and infants of healthy mothers regarding lipid profile, maternal age and birth weight. **Conclusion:** This study confirms that cord serum lipid profile (serum cholesterol, serum triglycerides and low-density lipoprotein) is higher at birth in IDM. Moreover, this study shows a significant association between lipid profile and body weight and maternal age.

KEYWORDS

INTRODUCTION:

Hyperglycemia is one of the most common complications in pregnancy, affecting an estimated 15.8% of live births in 2019. Of these, 83.6% were due to gestational diabetes mellitus (GDM), and 8.5% were due to diabetes first recognized during pregnancy.[1] Gestational diabetes mellitus (GDM) is defined as a glucose tolerance disorder with onset during pregnancy and is associated with increased feto-maternal morbidity as well as long-term complications in mother and child.[2] It is a major risk factor for fetal macrosomia or obesity. It was initially proposed that overgrowth of the fetus in maternal diabetes is the result of increased delivery of glucose to the fetus, which consequently develops premature maturation of pancreatic insulin secretion and subsequent hyperinsulinemia, which together with the excess availability of glucose results in overgrowth of the fetus. However, the increased incidence of macrosomia in newborns is also observed in diabetic pregnancy with satisfactory glycemic control and in GDM mothers who have similar glycosylated hemoglobin (HbA1c) levels as non-diabetic women. In diabetic pregnancy, a wide range of disturbances in lipid metabolism have been reported and maternal lipids are thought to be strong determinants of fetal growth in GDM pregnancies.[3]

Both maternal triacylglycerols (TAGs) and nonesterified fatty acids (NEFAs), rather than glucose, are positively correlated with neonatal weight and fat mass in well-controlled GDM women but not in normal pregnancies. This indicates that maternal dyslipemia in GDM actively enhances the availability of lipids to the fetus, contributing to fat depot accumulation and consequent risk of development of macrosomia.[3]

So our study aims to find any co relation with respect to Cord blood lipid profile values in infant of diabetic mother with respect to normal neonates.

MATERIALS AND METHODS:

The study carried out here is hospital based case control study, carried out at Rajarajeswari Medical college and hospital, Bangalore from August 2022 to January 2023. The study had total 60 neonates, out of which 30 were Term IDM neonates and 30 were normal Term neonates.

Inclusion criteria:

- Term IDM neonates born at Rajarajeswari Medical College and Hospital
- Term neonates born at Rajarajeswari Medical college and Hospital

Exclusion Criteria:

- Neonates with any Congenital malformations
- Neonates with a family history of hypercholesterolemia.
- Any maternal medication, except iron and vitamin supplements.
- Neonates born to mother with Tuberculosis, Asthma, Pregnancy-induced hypertension, thyroid disease.
- Neonates with one minute Apgar score <5

Both Cases and Controls were randomly selected based on inclusion and exclusion criteria. Term Neonate was defined as any neonate born more than or equal to 37 completed weeks of gestation.

Procedure:

All the subjects were included after obtaining written informed consent from parents/ guardian.

2 ml of cord blood was collected from the umbilical cord immediately after the delivery in a clot activated tube from the placental end of the cord. Cord blood was immediately sent to the lab where the samples were centrifuged then serum was separated. The sample was analysed by Beckman Coulter automated machine for lipid profile.

Later, the neonates were examined for weight by an electronic weighing scale, length by Infantometer, head circumference, chest circumference, and other relevant anthropometric data by a non-stretchable measuring tape. Gestational age was assessed using the Modified Ballard's score.

The neonates were classified as AGA and LGA based on Fenton's growth chart as per the gestational age and sex of the neonate. Neonates between 10th and 90th percentiles in the growth charts were classified as AGA and more than 90th percentile as LGA.

Statistical Analysis:

The statistical analysis was done with help of R programming software and Microsoft Excel was used to enter the data as well as generating graphs, tables etc.

The results were expressed in numbers and percentage for categorical variables and mean±standard deviation for continuous variables. Student T test and Chi-square test were used to compare the data for categorical and continuous variables respectively. All the tests of significance were applied at 5% level of significance

RESULTS:

Table 1: Distribution of data with Respect to Birth weight

Birth weight	Number	Percentage
LGA	7	12%
AGA	53	88%

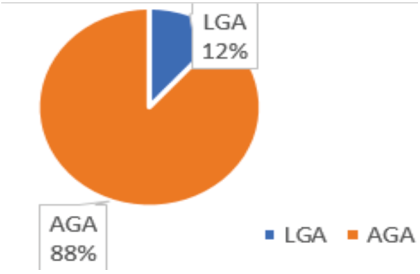

Figure 1: Birth weight distribution

Based on table 1 & Fig 1, it was found that the population of AGA in the study were more than LGA in the study.

Table 2: Gender distribution in IDM and Non IDM neonates groups

Gender	IDM neonates		Non IDM Neonates	
	Number	Percentage	Number	Percentage
Male	19	63.3	16	53.3
Female	11	36.7	14	46.7

Based on Table 2 data, it was found that the distribution of gender in IDM group was Male (63.3 %) predominant than Female (36.7%)

Table 3: Mode of delivery

Mode of Delivery	IDM Neonates		Non IDM Neonates	
	Number	Percentage	Number	Percentage
NVD	12	40	16	53.3
LSCS	18	60	14	46.7

According to Table 3, IDM neonates had more number of LSCS when compared to NVD, And Non IDM neonates were having almost equal distribution of LSCS and NVD

Table 4: Comparison of maternal age, Gestational age and birth weight between IDM and Non IDM neonates

	IDM Neonates	Non IDM Neonates	p Value
Maternal Age	27.8±4.32	25.4±3.02	0.01
Gestational Age	37.5±0.77	37.96±0.99	0.049
Birth weight	3.20±0.48	2.97±0.29	0.028

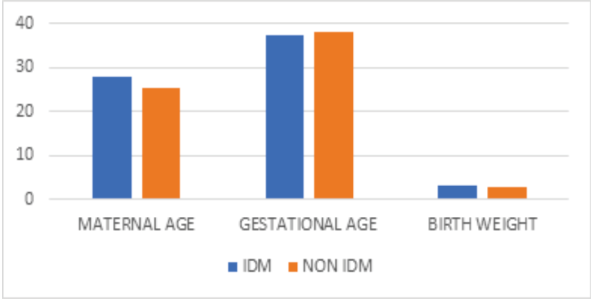

Figure 2: Comparision of mean values of Demographic data

According to table 4 & Fig 2, it was found that the data was statistically significant with respect to maternal age, gestational age and Birth weight when compared between IDM and Non IDM babies, where the maternal age and birth weight were more in IDM neonates and Gestational age was more in Non IDM babies comparatively.

Table 5: comparison of mean and standard deviation of cord lipid profile levels between IDM and non IDM neonates

	IDM Neonates	Non IDM Neonates	p Value
Total Cholesterol	80±28.53	53.93±5.6	<0.0001
Triglycerides	49.1±22.87	29.53±9.40	0.0001
HDL	28.87±7.30	23.63±3.89	0.019
LDL	44.97±18.26	29.27±4.40	<0.0001
VLDL	9.9±4.83	5.57±2.31	<0.0001
AI	2.74±0.66	2.32±0.36	0.0033

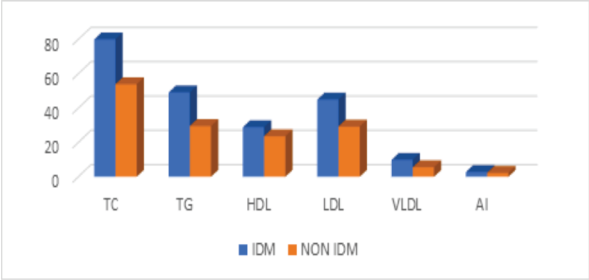

Fig 3: Comparison of mean of cord lipid levels in IDM and Non IDM

According to table 5 & Fig 3, the levels of Total Cholesterol, Triglyceride, HDL, LDL, VLDL and AI was found to be more in IDM neonates when compared to Non IDM neonates and the data is statistically significant (p Value <0.01).

Table 6: Comparison on mean and standard deviation of gestational diabetic mothers on medical nutritional therapy and on insulin or other treatments

	On Medical Nutrition Therapy	On Insulin and Other Treatments	p Value
Total Cholesterol	80.2±31.8	79.8±25.98	0.97
Triglycerides	45.9±25.04	52.27±20.85	0.45
HDL	30±6.67	27.73±7.95	0.40
LDL	44.73±6.67	45.2±16.26	0.92
VLDL	9.13±4.88	10.67±4.83	0.39
AI	2.73±0.75	2.75±0.58	0.93

According to table 6, there was no significant co relation between the gestational diabetic mothers on medical nutritional therapy and on any other treatment modalities for the same, but here the Glycemic control of the mothers were not taken into account.

DISCUSSION:

The presence of cardiovascular morbidities and mortality is directly correlated with abnormalities in lipid profiles, which serve as indicators of an underlying cardiovascular state. Because the majority of foetal lipids are produced de novo through the conversion of glucose to various fatty acid-containing compounds, the levels of lipids and lipoproteins in the cord sera should be a reflection of the status of plasma lipid metabolism in the newborn at birth. Since only a small portion of it is obtained from placental circulation, determining the lipid profile of cord blood is equivalent to determining the lipid metabolism both during pregnancy and at delivery.[4]

In women with well-controlled GDM but not in normal pregnancies, maternal triacylglycerols (TAGs) and non esterified fatty acids (NEFAs) are both favourably connected with newborn weight and fat mass rather than glucose. This suggests that maternal dyslipidemia in GDM actively increases the fetus's access to lipids, causing fat depots to build up and raising the likelihood of macrosomia development. Even though lipids have a tough time crossing the placenta, changes in placental function under the circumstances of GDM hyperlipidemia must be a factor in the enhanced transfer of maternal lipids to the foetus. The processing or metabolism of long-chain polyunsaturated fatty acids (LCPUFAs) in the foetus of GDM mothers has also been demonstrated to be altered, suggesting that such a disturbance may also be a factor in the build up of fat depots.[3]

Among various factors theorized in the development of atherosclerosis, increased plasma levels of cholesterol and/or triglycerides are considered to be most important. Barker's Hypothesis atherosclerotic lesion may have its origin in the neonatal period and adverse intrauterine environment during fetal development, may lead to impaired intrauterine growth and cardiovascular diseases in later adult life.[5] Hence determination of cord lipid profile become a useful tool in the earlier detection of babies at a higher risk.

In this study it was found that LGA babies were 7 out 60 neonates which accounts for around 12% of the sample and around 24% among IDM neonates. The maternal age at delivery when compared with Gestational diabetic mother was more than that of non gestational diabetic mothers with values being statistically significant (p value = 0.01) which was consistent with Mary Carolan et al.[6] our study also

showed that birth weights are significantly higher in IDM babies when compared to Non IDM babies (p value = 0.028) which is consistent with Yi Yang et al.[7]

When cord blood lipid profiles were co related with IDM and Non IDM neonates it was found that the levels of Total cholesterol, Triglycerides, HDL, LDL, VLDL and atherogenic index were significantly higher in IDM group with p values of <0.0001, 0.0001, 0.019, <0.0001, <0.0001 and 0.0033 respectively which was consistent with the values of Jasim Almusawi et al[4] except for HDL levels which was not statistically significant in their study.

Our study also tried to compare the cord lipid levels between gestational diabetic mothers on medical nutritional therapy and on insulin or other modalities of treatment which showed that the data was not statistically significant.

Limitations of the study:
- Small sample size, single centre study
- Glycemic control was not commented in mothers

CONCLUSION:

Our study showed significant difference between the two groups of infants with respect to Birth weight , mother's age where it was found to be more in infants of diabetic mothers. How ever, there was no co relation with respect to gestational age between the groups. It was also observed that there was significant difference with respect to cord blood lipid profiles, where the values were more in group with infants of diabetic mothers including HDL and atherogenic index. However, there was no significant difference between pre gestational diabetic and gestational diabetic mothers (indirect marker based on treatment modalities).

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES:

1. WHO criteria for diabetes in pregnancy: a retrospective cohort; Zaccara et al. BMC Pregnancy and Childbirth (2022) 22:385 https://doi.org/10.1186/s12884-022-04708-w
2. Kautzky-Willer A, Harreiter J, Winhofer-Stöckl Y, Bancher-Todesca D, Berger A, Repa A, Lechleitner M, Weitgasser R. Gestationsdiabetes (GDM) (Update 2019) [Gestational diabetes mellitus (Update 2019)]. Wien Klin Wochenschr. 2019 May;131(Suppl 1):91-102. German. doi: 10.1007/s00508-018-1419-8. PMID: 30980150.
3. Emilio Herrera and Gernot Desoye; Maternal and fetal lipid metabolism under normal and gestational diabetic conditions. Horm Mol Biol Clin Invest 2016; 26(2): 109–127; DOI :10.1515/hmbci-2015-0025
4. Cord Serum Lipid Profile of Infants of Diabetic Mothers by Jasim Almusawi; Iranian Journal of Neonatology 2015; 6(4)
5. Barker DJP. Fetal and infant origins of adult disease. Monatsschr Kinderheilkd. 2001;149(1):S2- 6.
6. Mary Carolan, Mary-Ann Davey, Mary Anne Biro, Michelle Kealy,Maternal age, ethnicity and gestational diabetes mellitus, Midwifery, Volume 28, Issue 6, 2012, Pages 778-783, ISSN 0266-6138, https://doi.org/10.1016/j.midw.2011.08.014. (https://www.sciencedirect.com/science/article/pii/S0266613811001306)
7. Yang Y, Wang Z, Mo M, Muyiduli X, Wang S, Li M, Jiang S, Wu Y, Shao B, Shen Y, Yu Y. The association of gestational diabetes mellitus with fetal birth weight. J Diabetes Complications. 2018 Jul;32(7):635-642. doi: 10.1016/j.jdiacomp.2018.04.008. Epub 2018 Apr 25. PMID: 29907325.
8. Pedersen J. Weight and length at birth of infants of diabetic mothers. Acta Endocrinol (Copenh) 1954;16:330–42.
9. Jimenez-Moleon JJ, Bueno-Cavanillas A, Luna-del-Castillo Jde D, Garcia-Martin M, Lardelli-Claret P, Galvez-Vargas R. Impact of different levels of carbohydrate intolerance on neonatal outcomes classically associated with gestational diabetes mellitus. Eur J Obstet Gynecol Reprod Biol 2002;102:36–41.
10. Sameshima H, Kamitomo M, Kajiya S, Kai M, Furukawa S, Ikenoue S. Early glycemic control reduces large-for-gestational-age infants in 250 Japanese gestational diabetes pregnancies. Am J Perinatol 2000;17:371–6.
11. Fraser D, Weitzman S, Leiberman JR, Eschwege E. Factors influencing birth weight in newborns of diabetic and nondiabetic women. A population based study. Eur J Epidemiol 1990;6:427–31.
12. Evers IM, de Valk HW, Mol BW, ter Braak EW, Visser GH. Macrosomia despite good glycaemic control in Type I diabetic pregnancy; results of a nationwide study in The Netherlands. Diabetologia 2002;45:1484–9.
13. Schwartz R, Gruppuso PA, Petzold K, Brambilla D, Hiilesmaa V, Teramo KA. Hyperinsulinemia and macrosomia in the fetus of the diabetic mother. Diabetes Care 1994;17:640–8.
14. Herrera E, Ortega-Senovilla H. Disturbances in lipid metabolism in diabetic pregnancy–Are these the cause of the problem? Best Pract Res Clin Endocrinol Metab 2010;24:515–25.
15. Schaefer-Graf UM, Graf K, Kulbacka I, Kjos SL, Dudenhausen J, Vetter K, Herrera E. Maternal lipids as strong determinants of fetal environment and growth in pregnancies with gestational diabetes mellitus. Diabetes Care 2008;31:1858–63.
16. Cord blood lipid profile in late preterm and term neonates Yashodha H. T., Syeda Kausar Anjum; International Journal of Contemporary Pediatrics Yashodha HT et al. Int J Contemp Pediatr. 2018 Mar;5(2):542-546